

## SEQUENCE LISTING

<110> Cox III, George Norbert  
Case, Casey Christopher  
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Jarvis, Eric Edward  
Spratt, Sharon Kaye  
Sangamo Biosciences, Inc.

<120> Regulation of Endogenous Gene Expression in Cells Using  
Zinc Finger Proteins

<130> 019496-002200US

<140> 09/229,037

<141> 1999-01-12

<160> 40

<170> PatentIn Ver. 2.0

<210> 1  
<211> 25  
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<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:exemplary motif  
of C2H2 class of zinc finger proteins (ZFP)

<220>

<221> MOD\_RES  
<222> (2)..(3)  
<223> Xaa = any amino acid

<220>

<221> MOD\_RES  
<222> (4)..(5)  
<223> Xaa = any amino acid, may be present or absent

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<221> MOD\_RES  
<222> (7)..(18)  
<223> Xaa = any amino acid

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<223> Xaa = any amino acid

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<222> (23)..(24)  
<223> Xaa = any amino acid, may be present or absent

<400> 1

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1 5 10 15

Xaa Xaa His Xaa Xaa Xaa Xaa His  
20 25

<210> 2  
<211> 10  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:ZFP target site  
with two overlapping D-able subsites

<220>  
<221> modified\_base  
<222> (1)..(2)  
<223> n = g,a,c or t

<220>  
<221> modified\_base  
<222> (5)  
<223> n = g,a,c or t

<220>  
<221> modified\_base  
<222> (8)  
<223> n = g,a,c or t

<220>  
<221> modified\_base  
<222> (9)  
<223> n = a,c or t; if g, then position 10 cannot be g  
or t

<220>  
<221> modified\_base  
<222> (10)  
<223> n = a or c; if g or t, then position 9 cannot be g

<400> 2  
nngkngknnn

<210> 3  
<211> 10  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:ZFP target site  
with three overlapping D-able subsites

<220>  
<221> modified\_base  
<222> (1)..(2)  
<223> n = g,a,c or t

<220>  
<221> modified\_base  
<222> (5)  
<223> n = g,a,c or t

<220>  
 <221> modified\_base  
 <222> (8)  
 <223> n = g,a,c or t

<400> 3  
 nngkngkngk

10

<210> 4  
 <211> 5  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:linker

<400> 4  
 Asp Gly Gly Gly Ser  
 1 5

<210> 5  
 <211> 5  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:linker

<400> 5  
 Thr Gly Glu Lys Pro  
 1 5

<210> 6  
 <211> 9  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:linker

<400> 6  
 Leu Arg Gln Lys Asp Gly Glu Arg Pro  
 1 5

<210> 7  
 <211> 4  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:linker

<400> 7  
 Gly Gly Arg Arg  
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<210> 8  
<211> 5  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:linker

<400> 8  
Gly Gly Gly Gly Ser  
1 5

<210> 9  
<211> 8  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:linker

<400> 9  
Gly Gly Arg Arg Gly Gly Ser  
1 5

<210> 10  
<211> 9  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:linker

<400> 10  
Leu Arg Gln Arg Asp Gly Glu Arg Pro  
1 5

<210> 11  
<211> 12  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:linker

<400> 11  
Leu Arg Gln Lys Asp Gly Gly Ser Glu Arg Pro  
1 5 10

<210> 12  
<211> 16  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:linker

<400> 12  
 Leu Arg Gln Lys Asp Gly Gly Ser Gly Gly Ser Glu Arg' Pro  
 1 5 10 15

<210> 13  
 <211> 25  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:ZFP target site  
 region surrounding initiation site of vascular  
 endothelial growth factor (VEGF) gene containing  
 two 9-base pair target sites

<220>  
 <221> protein\_bind  
 <222> (4)..(12)  
 <223> upstream 9-base pair ZFP VEGF1 target site

<220>  
 <221> protein\_bind  
 <222> (14)..(22)  
 <223> downstream 9-base pair ZFP VEGF3a target site

<400> 13  
 agcggggagg atcgcggagg cttgg 25

<210> 14  
 <211> 298  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:VEGF1 ZFP  
 construct targeting upstream 9-base pair target  
 site in VEGF promoter

<220>  
 <221> CDS  
 <222> (2)..(298)  
 <223> VEGF1

<400> 14  
 g gta ccc ata cct ggc aag aag aag cag cac atc tgc cac atc cag ggc 49  
 Val Pro Ile Pro Gly Lys Lys Gln His Ile Cys His Ile Gln Gly  
 1 5 10 15

tgt ggt aaa gtt tac ggc aca acc tca aat ctg cgt cgt cac ctg cgc 97  
 Cys Gly Lys Val Tyr Gly Thr Ser Asn Leu Arg Arg His Leu Arg  
 20 25 30

tgg cac acc ggc gag agg cct ttc atg tgt acc tgg tcc tac tgt ggt 145  
 Trp His Thr Gly Glu Arg Pro Phe Met Cys Thr Trp Ser Tyr Cys Gly  
 35 40 45

aaa cgc ttc acc cgt tcg tca aac ctg cag cgt cac aag cgt acc cac 193  
 Lys Arg Phe Thr Arg Ser Ser Asn Leu Gln Arg His Lys Arg Thr His  
 50 55 60

acc ggt gag aag aaa ttt gct tgc ccg gag tgt ccg aag cgc ttc atg 241  
 Thr Gly Glu Lys Lys Phe Ala Cys Pro Glu Cys Pro Lys Arg Phe Met  
 65 70 75 80

cgt agt gac cac ctg tcc cgt cac atc aag acc cac cag aat aag aag 289  
 Arg Ser Asp His Leu Ser Arg His Ile Lys Thr His Gln Asn Lys Lys  
 85 90 95

ggt gga tcc 298  
 Gly Gly Ser

<210> 15  
 <211> 99  
 <212> PRT  
 <213> Artificial Sequence

<400> 15  
 Val Pro Ile Pro Gly Lys Lys Gln His Ile Cys His Ile Gln Gly  
 1 5 10 15

Cys Gly Lys Val Tyr Gly Thr Thr Ser Asn Leu Arg Arg His Leu Arg  
 20 25 30

Trp His Thr Gly Glu Arg Pro Phe Met Cys Thr Trp Ser Tyr Cys Gly  
 35 40 45

Lys Arg Phe Thr Arg Ser Ser Asn Leu Gln Arg His Lys Arg Thr His  
 50 55 60

Thr Gly Glu Lys Lys Phe Ala Cys Pro Glu Cys Pro Lys Arg Phe Met  
 65 70 75 80

Arg Ser Asp His Leu Ser Arg His Ile Lys Thr His Gln Asn Lys Lys  
 85 90 95

Gly Gly Ser

<210> 16  
 <211> 298  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:VEGF3a ZFP  
 construct targeting downstream 9-base pair target  
 site in VEGF promoter

<220>  
 <221> CDS  
 <222> (2)..(298)  
 <223> VEGF3a

<400> 16  
 g gta ccc ata cct ggc aag aag aag cag cac atc tgc cac atc cag ggc 49  
 Val Pro Ile Pro Gly Lys Lys Gln His Ile Cys His Ile Gln Gly  
 1 5 10 15

tgt ggt aaa gtt tac ggc cag tcc tcc gac ctg cag cgt cac ctg cgc	97
Cys Gly Lys Val Tyr Gly Gln Ser Ser Asp Leu Gln Arg His Leu Arg	
20 25 30	
tgg cac acc ggc gag agg cct ttc atg tgt acc tgg tcc tac tgt ggt	145
Trp His Thr Gly Glu Arg Pro Phe Met Cys Thr Trp Ser Tyr Cys Gly	
35 40 45	
aaa cgc ttc acc cgt tcg tca aac cta cag agg cac aag cgt aca cac	193
Lys Arg Phe Thr Arg Ser Ser Asn Leu Gln Arg His Lys Arg Thr His	
50 55 60	
acc ggt gag aag aaa ttt gct tgc ccg gag tgt ccg aag cgc ttc atg	241
Thr Gly Glu Lys Lys Phe Ala Cys Pro Glu Cys Pro Lys Arg Phe Met	
65 70 75 80	
cga agt gac gag ctg tca cga cat atc aag acc cac cag aac aag aag	289
Arg Ser Asp Glu Leu Ser Arg His Ile Lys Thr His Gln Asn Lys Lys	
85 90 95	
ggt gga tcc	298
Gly Gly Ser	

<210> 17  
 <211> 99  
 <212> PRT  
 <213> Artificial Sequence

<400> 17	
Val Pro Ile Pro Gly Lys Lys Gln His Ile Cys His Ile Gln Gly	
1 5 10 15	
Cys Gly Lys Val Tyr Gly Gln Ser Ser Asp Leu Gln Arg His Leu Arg	
20 25 30	
Trp His Thr Gly Glu Arg Pro Phe Met Cys Thr Trp Ser Tyr Cys Gly	
35 40 45	
Lys Arg Phe Thr Arg Ser Ser Asn Leu Gln Arg His Lys Arg Thr His	
50 55 60	
Thr Gly Glu Lys Lys Phe Ala Cys Pro Glu Cys Pro Lys Arg Phe Met	
65 70 75 80	
Arg Ser Asp Glu Leu Ser Arg His Ile Lys Thr His Gln Asn Lys Lys	
85 90 95	
Gly Gly Ser	

<210> 18  
 <211> 29  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:VEGF DNA target  
 site 1 recognition (top) strand

<220>  
 <221> protein\_bind  
 <222> (11)..(19)  
 <223> VEGF DNA ZFP target site 1

<400> 18  
 catgcatagc ggggaggagtc gccatcgat

29

<210> 19  
 <211> 29  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:VEGF DNA site 1  
 complementary (bottom) strand

<400> 19  
 atcgatggcg atcctcccg ctatgcgt

29

<210> 20  
 <211> 29  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:VEGF DNA  
 target site 3 recognition (top) strand

<220>  
 <221> protein\_bind  
 <222> (11)..(19)  
 <223> VEGF DNA ZFP target site 3

<400> 20  
 catgcatatc gcggaggctt ggcatcgat

29

<210> 21  
 <211> 29  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:VEGF DNA target  
 site 3 complementary (bottom) strand

<400> 21  
 atcgatgcca agcctccgcg atatgcgt

29

<210> 22  
 <211> 29  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:primer SPE7

<400> 22		
gagcagaatt cggcaagaag aagcagcac		29
<210> 23		
<211> 26		
<212> DNA		
<213> Artificial Sequence		
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<223> Description of Artificial Sequence:primer SPEamp12		
<400> 23		
gtggcttaga cagctcgtca cttcgc		26
<210> 24		
<211> 28		
<212> DNA		
<213> Artificial Sequence		
<220>		
<223> Description of Artificial Sequence:primer SPEamp13		
<400> 24		
ggagccaagg ctgtggtaaa gtttacgg		28
<210> 25		
<211> 26		
<212> DNA		
<213> Artificial Sequence		
<220>		
<223> Description of Artificial Sequence:primer SPEamp11		
<400> 25		
ggagaagctt ggatcctcat tatccc		26
<210> 26		
<211> 83		
<212> DNA		
<213> Artificial Sequence		
<220>		
<223> Description of Artificial Sequence:sequence ligated between XbaI and StyI sites		
<400> 26		
tctagacaca tcaaaaccca ccagaacaag aaagacggcg gtggcagcgg caaaaagaaa	60	
cagcacatat gtcacatcca agg		83
<210> 27		
<211> 39		
<212> DNA		
<213> Artificial Sequence		

<220>  
 <223> Description of Artificial Sequence:primer GB19  
 <400> 27  
 gccatgccgg tacccatacc tggcaagaag aagcagcac 39

<210> 28  
 <211> 33  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:primer GB10  
 <400> 28  
 cagatcgat ccacccttct tattctggtg ggt 33

<210> 29  
 <211> 589  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:designed  
 6-finger ZFP VEGF3a/1 from KpnI to BamHI

<220>  
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 <222> (2)..(589)  
 <223> VEGF3a/1

<400> 29  
 g gta ccc ata cct ggc aag aag aag cag cac atc tgc cac atc cag ggc 49  
 Val Pro Ile Pro Gly Lys Lys Lys Gln His Ile Cys His Ile Gln Gly  
 1 5 10 15

tgt ggt aaa gtt tac ggc cag tcc gac ctg cag cgt cac ctg cgc 97  
 Cys Gly Lys Val Tyr Gly Gln Ser Ser Asp Leu Gln Arg His Leu Arg  
 20 25 30

tgg cac acc ggc gag agg cct ttc atg tgt acc tgg tcc tac tgt ggt 145  
 Trp His Thr Gly Glu Arg Pro Phe Met Cys Thr Trp Ser Tyr Cys Gly  
 35 40 45

aaa cgc ttc aca cgt tcg tca aac cta cag agg cac aag cgt aca cac 193  
 Lys Arg Phe Thr Arg Ser Ser Asn Leu Gln Arg His Lys Arg Thr His  
 50 55 60

aca ggt gag aag aaa ttt gct tgc ccg gag tgt ccg aag cgc ttc atg 241  
 Thr Gly Glu Lys Phe Ala Cys Pro Glu Cys Pro Lys Arg Phe Met  
 65 70 75 80

cga agt gac gag ctg tct aga cac atc aaa acc cac cag aac aag aaa 289  
 Arg Ser Asp Glu Leu Ser Arg His Ile Lys Thr His Gln Asn Lys Lys  
 85 90 95

gac ggc ggt ggc agc ggc aaa aag aaa cag cac ata tgt cac atc caa 337  
 Asp Gly Gly Ser Gly Lys Lys Lys Gln His Ile Cys His Ile Gln  
 100 105 110

ggc tgt ggt aaa gtt tac ggc aca acc tca aat ctg cgt cgt cac ctg	385
Gly Cys Gly Lys Val Tyr Gly Thr Thr Ser Asn Leu Arg Arg His Leu	
115 120 125	
cgc tgg cac acc ggc gag agg cct ttc atg tgt acc tgg tcc tac tgt	433
Arg Trp His Thr Gly Glu Arg Pro Phe Met Cys Thr Trp Ser Tyr Cys	
130 135 140	
ggt aaa cgc ttc acc cgt tcg tca aac ctg cag cgt cac aag cgt acc	481
Gly Lys Arg Phe Thr Arg Ser Ser Asn Leu Gln Arg His Lys Arg Thr	
145 150 155 160	
cac acc ggt gag aag aaa ttt gct tgc ccg gag tgt ccg aag cgc ttc	529
His Thr Gly Glu Lys Phe Ala Cys Pro Glu Cys Pro Lys Arg Phe	
165 170 175	
atg cgt agt gac cac ctg tcc cgt cac atc aag acc cac cag aat aag	577
Met Arg Ser Asp His Leu Ser Arg His Ile Lys Thr His Gln Asn Lys	
180 185 190	
aag ggt gga tcc	589
Lys Gly Gly Ser	
195	
<210> 30	
<211> 196	
<212> PRT	
<213> Artificial Sequence	
<400> 30	
Val Pro Ile Pro Gly Lys Lys Lys Gln His Ile Cys His Ile Gln Gly	
1 5 10 15	
Cys Gly Lys Val Tyr Gly Gln Ser Ser Asp Leu Gln Arg His Leu Arg	
20 25 30	
Trp His Thr Gly Glu Arg Pro Phe Met Cys Thr Trp Ser Tyr Cys Gly	
35 40 45	
Lys Arg Phe Thr Arg Ser Ser Asn Leu Gln Arg His Lys Arg Thr His	
50 55 60	
Thr Gly Glu Lys Lys Phe Ala Cys Pro Glu Cys Pro Lys Arg Phe Met	
65 70 75 80	
Arg Ser Asp Glu Leu Ser Arg His Ile Lys Thr His Gln Asn Lys Lys	
85 90 95	
Asp Gly Gly Ser Gly Lys Lys Gln His Ile Cys His Ile Gln	
100 105 110	
Gly Cys Gly Lys Val Tyr Gly Thr Thr Ser Asn Leu Arg Arg His Leu	
115 120 125	
Arg Trp His Thr Gly Glu Arg Pro Phe Met Cys Thr Trp Ser Tyr Cys	
130 135 140	
Gly Lys Arg Phe Thr Arg Ser Ser Asn Leu Gln Arg His Lys Arg Thr	
145 150 155 160	

His Thr Gly Glu Lys Lys Phe Ala Cys Pro Glu Cys Pro Lys Arg Phe  
 165 170 175

Met Arg Ser Asp His Leu Ser Arg His Ile Lys Thr His Gln Asn Lys  
 180 185 190

Lys Gly Gly Ser  
 195

<210> 31  
 <211> 42  
 <212> DNA  
 <213> Artificial Sequence

<220>  
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 target oligonucleotide

<400> 31  
 agcgagcggg gaggatcgcg gaggcttggg gcagccgggt ag 42

<210> 32  
 <211> 42  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:JVF10 VEGF3a/1  
 target oligonucleotide complementary sequence

<400> 32  
 cgctctaccc ggctgccccca agcctccgcg atcctcccg ct 42

<210> 33  
 <211> 25  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:primer JVF24

<400> 33  
 cgcggatccg cccccccgac cgatg 25

<210> 34  
 <211> 62  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:downstream  
 primer JVF25

<400> 34  
 ccgcaagctt acttgtcatc gtcgtccttg tagtcgctgc ccccacccgtta ctcgtcaatt 60

<210> 35  
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 <213> Simian virus 40  
  
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 <222> (1)..(7)  
 <223> SV40 large T antigen nuclear localization sequence  
 (NLS)  
  
 <400> 35  
 Pro Lys Lys Lys Arg Lys Val  
 1 5

<210> 36  
 <211> 61  
 <212> DNA  
 <213> Artificial Sequence  
  
 <220>  
 <223> Description of Artificial Sequence:segment from  
 EcoRI to KpnI containing Kozak sequence including  
 initiation codon and SV40 NLS

<400> 36  
 gaattcgcta gcgcaccat ggccccaag aagaagagga aggtggaaat ccatgggta 60  
 C 61

<210> 37  
 <211> 187  
 <212> DNA  
 <213> Artificial Sequence  
  
 <220>  
 <223> Description of Artificial Sequence:segment from  
 KpnI to XhoI containing BamHI site, KRAB-A box  
 from KOX1, FLAG epitope and HindIII site

<400> 37  
 ggtacccggg gatccggac actggtgacc ttcaaggatg tatttgtgga cttcaccagg 60  
 gaggagtgga agctgctgga cactgcttag cagatcgtagt acagaaatgt gatgctggag 120  
 aactataaga acctggtttc cttgggcagc gactacaagg acgacgatga caagtaagct 180  
 tctcgag 187

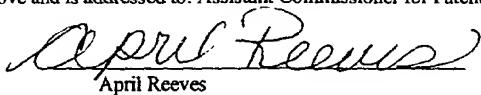
<210> 38  
 <211> 277  
 <212> DNA  
 <213> Artificial Sequence  
  
 <220>  
 <223> Description of Artificial Sequence:inserted  
 fragment from BamHI to HindIII sites

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Date of Deposit: February 15, 2001

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April Reeves

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

G.N. Cox III *et al.*

Application No.: 09/229,037

Filed: January 12, 1999

For: REGULATION OF ENDOGENOUS  
GENE EXPRESSION IN CELLS  
USING ZINC FINGER PROTEINS

Examiner: J. Lundgren

Group Art Unit: 1631

REVOCATION OF POWER OF ATTORNEY  
AND NEW POWER OF ATTORNEY

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

I, Casey Case, Vice President for Research of the assignee, Sangamo BioSciences, Inc. by virtue of an assignment recorded at Reel 010418 and Frame 0960 on April 1, 1999 hereby revoke all powers of attorney heretofore existing in the above-identified application and hereby appoint Sean M. Brennan, Ph.D., Reg. No. 39,917, Dahna S. Pasternak, Reg. No. 41,411, Roberta L. Robins, Reg. No. 33,208 and Gary R. Fabian, Reg. No. 33,875 as our attorneys and agents to prosecute said application, and to transact all business in the Patent and Trademark Office connected therewith.

Please direct all further communications regarding this application to:

Sean Brennan,  
Sangamo BioSciences, Inc.  
501 Canal Blvd., Suite A100  
Richmond, California 94804

Date: February 15, 2001

By:

Casey Case

Casey Case